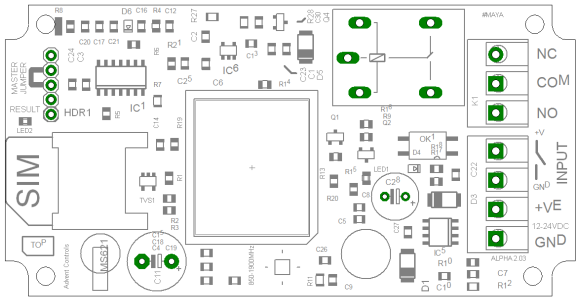
Command	Action			Comments
ADD	*number*	.		Add User Number
CALL	**LIST**	ANY	NONE	Call Handling
CALLNUM	*number*			Add Autodial Call Number
CLEARALL				Also clears MASTER
CLOSE				Deactivate Relay
CONNECT	**NONE**	CL	OP	Connect Call Condition
CSQ				Get RSSI
CTIME	***<seconds>***	.		Set Call Maximum Time Limit
CUSTOM				Custom input message
DIAL	*number*			Dial Number on Receipt
EXIT	**DIS**	EN		Exit Switch Enable
INPUT	**DIS**	EN		Input Trigger Enable
INLEVEL	**OPEN**	CLOSE		Input Edge Trigger Setting
LIST				List All Numbers
MASTER	*number*	.		Add Master User
MUSER	**DISABLE**	ENABLE		Treat all users as Master
OFF [as CLOSE}				Deactivate Relay
OPEN/ON				Activate Relay
OPEN/ON	<*seconds*>			Open for <*seconds*> seconds
OPEN/ON	<*minutes*>m.			Open for <*minutes*> minutes
PLAY	<sequence>			Not implemented in F2.11
PRGSIM				Purge Inbox
PSMS	**Enable**	Disable		Power Up Text Alert
QUERY/QNUM	*number*	.		Find Number in Memory
REJECT	ALL	**NEVER**	OPEN	Call Handling
REM	*number*	.		Remove Number
RESET				Reset Settings to Defaults
RLYMODE	**PULSE**	TOGGLE	RING	Relay Mode Toggle/Pulse
RLYTIME	<*seconds*>			(default 3s)
RLYTIME	<*minutes*>m	.		relay time in minutes
RSMS	**Enable**	Disable		Reset Text Alert (Network)
RTIME	<*seconds*>			Maximum Ring Time
SILENCE	<*seconds*>			Maximum Line Silence Time
SMS	*number,*	*interval (days)*	.	PAYG Keep Alive
SMS	**OFF**			(switch off KA Text)
STATUS				Get Relay and Input Status
TEXTNUM	***<master>***	*number*	.	Input Trigger Text Numbers
TEXTRES	**DIS**	EN		Result Acknowledgement

Advent Controls

QUAD Band GSM Relay Board and Auto-Dialler

Alpha 2.04/Firmware 2.11



Open-on-Call Access Control with Text Alert & Auto-Dial

for GSM850MHz, GSM900MHz DCS1800MHz & PCS1900MHz

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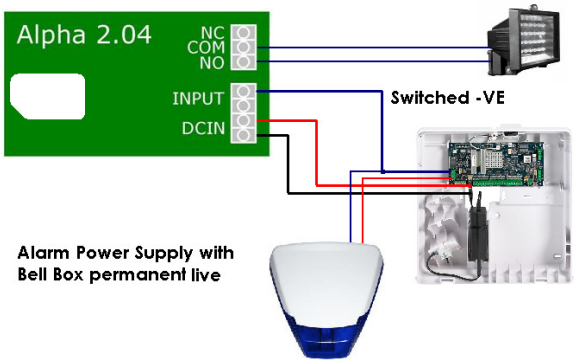
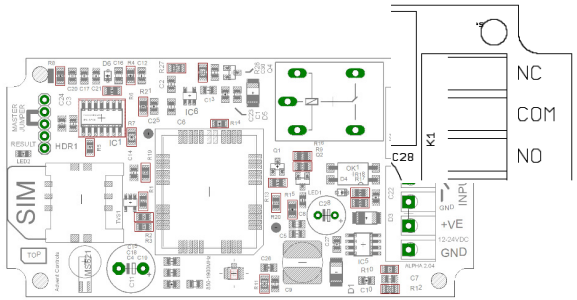


6.4 Output Connection

The relay output has Normally Open (NO) and Normally Closed (NC) relative to COMmon (COM) connections. These can be actuated in a momentary operation or can be toggled (see **3 Setup**).

The connections are 'voltage free' with no connection to +VE or GND. The relay connections have a minimum creepage distance greater than 4mm and are CATII rated to 220V.



6.5 Antenna Connection

The standard antenna can be used where a good signal exists. In areas with a poor signal an external antenna is recommended connected via RG174 coaxial cable. The system antenna connection is a male Hirose U.FL connector. It is not recommended to use an extension greater than 3m in length.

6.6 Mounting

The PCB has been designed to fit into a Hammond 1591B enclosure. When mounting the unit into such an enclosure the enclosure must be modified to allow for the antenna/coaxial cable to be connected. When mounting in a metal cabinet, an external antenna must be used, connected using 50ohm impedance coaxial cable. If required, please contact support@adventcontrols.co.uk for assistance.

6 Installation

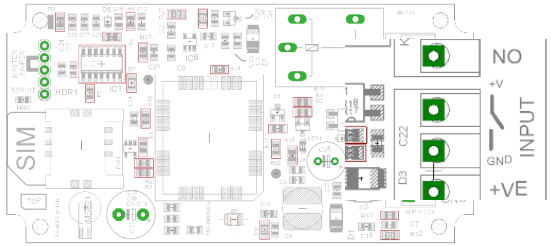
6.1 Power Connection

A fused DC power supply of between 12 and 24VDC should be used with this product. The power connection should be made to the terminals labelled +VE and GND.

Please note if using this equipment in a motor vehicle please consult Advent Controls prior to fitting (support@adventcontrols.co.uk)

6.2 Input Connection

The input is optically isolated from the main circuitry and is connected to ground (GND) to become active (LOW). The two terminals labelled 'INPUT' should be connected to an otherwise unused switch.



6.3 Connection to a Burglar Alarm

The system features an optically isolated input terminal which is driven low (to GND or -VE) in the active state. The +V terminal is pulled to 13V (or +VE if +VE is less than 13V) through a 2200 Ohm load. The +V terminal on the Alpha Relay Board may be connected to the –VE terminal of a burglar alarm bell output to allow the system to be used as an alarm auto-dialler and SMS sender. Both equipment must share a common GND connection.

Please note, whilst most alarms pull the negative terminal down to ground when active, the installer should ensure this is the case with their alarm system. It may be necessary to use an intermediate relay board for connection to some systems. Please contact support@adventcontrols.co.uk for assistance.

1. Introduction

The Advent Controls Alpha GSM Relay Board has been primarily designed for security applications although can be used as a general purpose call/SMS activated relay. The board also features an optically-isolated DC input which can be used to trigger dialling and/or sending of a customisable Short Message Service (SMS) alert message to up to 512 numbers.

The relay can be activated by a call or SMS text from up to 512 stored telephone numbers or can be configured to activate when receiving a call from any number. By default the call will not be answered and hence costs the caller nothing. However, the system can also be set to reject the call or connect a call when either the input is open or closed (or both). This allows the input status to be determined even when the SIM card does not have credit for SMS text messages.

Setup and operation is performed by simple SMS text messages including adding and removing user telephone numbers. A complete list of accepted telephone numbers can be viewed via SMS text message. The memory can also be scanned to see if it contains an individual number and the result is displayed by the on-board LED and (if enabled—see **2.10 TEXTRES**) by SMS text message.

The output relay has both Normally Open (NO) and Normally Closed (NC) with Common (COM) connections. The action of the relay can be a single timed actuation from either 1s to 999s or 1 to 999 minutes or the relay can be set to toggle between calls.

1.2 Technical Specification

Power Supply	12-24VDC 500mA Max. (10-15mA idle)
Relay Output	5A Max. CATII 220VAC
SIM	1.8/3.6V
Compliant with GSM Phase 2/2+	Class 4 (2W @850/900 MHz) Class 1 (1W @1800/1900 MHz)
Antenna	50Ω U.FL

1.3 Number Types

When adding a telephone number to the system it can be set up as one of four different telephone number types with each type having a specific purpose. There is space for 512 numbers and each number can be set up as any type of number. For example you may wish to have 200 masters and 312 users. **All four number groups can operate the output relay by SMS text or by calling the board.**

Master Numbers

These numbers are used to make changes to board including adding other numbers. At least one master number must be set up when the board is first used (see **section 2.3**). Once one master number is set up it can then be used to set up other master numbers

Example Master Number setup command:

Master 07000000000.

User Numbers

User numbers are only able to operate the relay output only. This can be via SMS text or by calling the board. Unless MUSER is enabled (this makes all numbers master numbers) user numbers cannot access any command functions.

Example User Number setup command:

Add 07000000000.

Text Numbers

These numbers are the recipients of input triggered SMS text messages. The board sends SMS text messages to these numbers in the order in which they are added. These numbers cannot access any of the board's command functions but are able to operate the output relay by call or text. Note, if a master or user sends a command to the board which results in a SMS text reply, the reply is sent to the sender of the command and not the list of text numbers.

Example Text Number setup command:

TXTNUM 07000000000. For backward compatibility TXTNUM is also allowed
TEXTNUM 07000000000.

Call Numbers

Call numbers are dialled when the input is triggered. Call numbers are dialled before the sending of SMS text messages to the Text Numbers. They are dialled in the order in which they are added. The numbers are dialled sequentially until a call is answered and rejected or a call is answered and the # key is pressed. See Section 4.1 Auto-Dialler for details.

Example Call Number setup command:

Callnum 07000000000.

2. Operation

2.1 Registration

A valid GSM Subscriber Identity Module (SIM) card must be present in the SIM holder for the system to operate. Immediately on power up the system will attempt to register on the SIM card on it's home network. Once registration has occurred LED1 will change from flashing approximately once every second to a momentary flash once every two seconds. If the LED1 continues to flash once every second for some time, the system cannot register the SIM on the network. The system will restart should this occur. If the problem persists check the antenna and strength of signal in your area/validation of the SIM card. Observe anti-static precautions when inserting the SIM.

The second LED, LED2 found by the 5 pin header, is used to display the result of a command. **The LED will flash twice to acknowledge the successful receipt of a command** and will light continuously for 2s to show the instruction has failed. It also illuminates during any call (valid or invalid) and lights continuously when a signal cannot be found (network dependent).

When using a Pay As You Go (PAYG) SIM card, to avoid SIM card deactivation, the system can periodically send a SMS text message to keep the SIM active. Ensure the SIM card has sufficient credit to make a call or text (even if the call goes unanswered). To setup the Keep Alive Text function the following SMS text message is sent to the system:

SMS<space>*number,frequency*. enables periodic text message sending

e.g. **SMS 07000000000,10.** (text 07000000000 every 10 days)
SMS Off disables periodic text message sending

Frequency—number of days interval

Most UK networks require the equivalent spend of one one minute call per quarter. It is recommended a text is sent at least once per month (28 days).

5.2 Signal Strength Indicator

When setting up the system it is important to know the strength of signal for reliable operation. To receive a message showing the Received Signal Strength Indicator (RSSI) the CSQ command is sent to the system as follows:

CSQ

When the system SIM card has sufficient credit a SMS text message is sent to the number which sent the command displaying the current RSSI.

e.g. >RSSI 21

The RSSI can be converted to an approximate Signal to Noise Ratio (SNR) in decibels using the following formula:

RSSI (dBm) = -113 + 2x(CSQ value)

It is recommended that the minimum signal level for the installation is 15 (-83dBm) to ensure reliable operation. The system will operate below –100dBm but may become unresponsive at times.

To achieve an improved RSSI the standard antenna can be upgraded to a model with higher gain and/or the antenna should be positioned in an area with less physical obstruction. An extension lead can be attached to the SMA connector on the PCB to locate the antenna away from the control unit housing.

5.3 Power Up/Reset Text Message

The system can send an message to all the text numbers when a system reset or power up has occurred. This can be due to network failure or power cycling (power off followed by power on). Note the system repeatedly resets during network outage. You will only receive 1-message after a network outage.

RSMS Enable enables the reset text message
RSMS Disable disables the reset text message
PSMS Enable enables the power up text message
PSMS Disable disables the power up text message

4.6 Changing the Maximum Line Silence Time

The maximum time for which a silent call will remain connected is set using the SILENCE command. This is useful were a call may be redirected to voicemail. The silence during recording will cause the system to hang the call. The default silence time is 15s and can be set from 1s to 255s.

SILENCE 25. sets the maximum line silence time to 25 seconds

4.7 Adding Auto-dialler SMS Text Numbers

The system can send the input triggered message (2.16) to up to all 511 numbers. To add a text number the following SMS text message is sent to the system by any master number:

TEXTNUM<space>*number.*

e.g. **textnum 07000000000.**

N.B. Text numbers can also activate the output—there is no need to ADD the number twice!

4.8 Adding Auto-dialler Call Numbers

The system can call up to all 511 numbers when the input is triggered. To add a call number the following SMS text message is sent to the system by any master number:

CALLNUM<space>*number.*

e.g. **callnum 07000000000.**

N.B. Call numbers can also activate the output—there is no need to ADD the number twice!

4.9 Dial Now

If necessary the system can make a call to a number not stored in it's memory at any time. This is achieved using the DIAL command. The call observes the RTIME, CTIME and SILENCE time settings

DIAL<*space*>*number*. make an ad-hoc call to the specified number

e.g. dial 01517283167.

The call will end when the other party hangs up or the CTIME or SILENCE time limit is reached.

5 Setup

5.1 SIM Keep Alive Text

2.2 Command Message Format

To operate the system a master GSM phone is used to send SMS text messages to the system telephone number. All message follow a similar format as follows:

COMMAND<space>*action. (eg.* Master 07000000000.)

The command (see **Section 7**) is always written first followed by a space and the action required. Although not necessary, it is useful to include a full stop immediately after the action as some mobile phones can enter superfluous characters at the end of a message, which can invalidate the message. The message is **not** cAsE sensitive.

2.3 Master Number Setup

The system is controlled by the master GSM mobile phone numbers (see **2.2 Number Types**). The system must first be associated with at least one master phone's number before it can be used. To do this the supplied 2.54mm jumper connector must be fitted to pins 3 & 4 on HDR1 as shown in red in Figure 1. Do not connect the jumper to any other pins or damage may result.

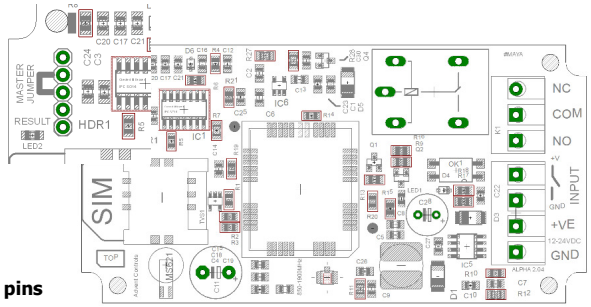


Figure 1. Jumper pins

The master phone number must then be sent via a SMS text message to the system phone number as follows:

MASTER<space>*number.*

For example, if the master telephone number is 07000 000 000:

MASTER 07000000000.

Also valid are the following:

Master 07000000000 and master 07000000000

The following messages are invalid:

master 07000 000 000. (spaces in the number)
master07000000000 (no space after 'master')

The result LED, LED2, will flash two times to indicate the master number has been successfully setup. Calling the board's telephone number with the master phone will now activate the relay. Once one master number has been setup further masters (up to 512) can be setup by this and subsequent master phones without the jumper fitted (using the same message).

Using the PIN for Master Setup

The Master Number can also be set up using the PIN. This is only possible for the first master number that is added to the system. Subsequent masters must be added by a master using the MASTER command. The PIN is the last 5 characters of the IMEI number written on the QUECTEL GSM module sticker. The command is sent as follows:

Master 07000000000,37212. for module with IMEI 355073034237212

2.4 Allowing Master Control for all Users

To enable any user to control master commands (such as adding and removing numbers) the MUSER command is sent to the board, by a master number, as follows:

MUSER ENABLE Allows any valid user number to modify settings
MUSER DISABLE Only master numbers can modify settings

By default MUSER is set to disable full access for all users. N.B. Only master numbers can add other master numbers despite this setting

2.5 Adding a User Number

Any telephone number of at least 5 digits where caller ID is available is valid. The system only compares the last 8 digits (if present) of any calling number against the numbers stored in memory. Therefore it is not necessary to enter the international dialling code format of the telephone number.

i.e. for 070**00000000** only the characters shown in **BOLD** text are considered

The ADD command is used to add a new telephone number. To add a new number any master phone must send the following SMS text message to the system telephone number:

add<space>*number*. e.g. **Add 07000000000.**

If TEXTRES is enabled the system will respond with the 'Operation Successful' message.

2.6 Removing a User Number

The REM command is used to remove an existing telephone number. To remove an existing telephone number any master phone must send the following SMS text message:

rem<space>*number*. e.g. **REM 07000000000.**

If TEXTRES is enabled the system will respond with the 'Operation Successful' message. If the number is not found the 'Operation Failed' message will be sent by the system.

2.7 Viewing the Valid Number List

The system can send a SMS text message containing a complete list of valid user numbers to any master phone.

Also valid:

input e
input d

4.2 Input Change State Level

The INLVL sets the active state of the input for sending the change state text message. For example, if the user requires a message to be sent when the input is closed (GND), then the following message is sent by the master number:

INLVL CLOSED send status message when input closed (GND)

If the user requires the system to send a status message when the input goes open (+5V) the following message is sent by the master number:

INLVL OPEN text when open (+5V)

The change state service becomes inactive whilst the input remains in the active state (i.e. GND for INLVL CL/+V for INLVL OP) and remains inactive for 5 seconds after returning to the idle state.

4.3 Customising the Input Alert Message

The default input alert message is '>INPUT ACTIVE'. This can be customised by the user using the CUSTOM command. The maximum length of the message is 128 characters and it **must** end with a full stop. The custom command is used as follows:

CUSTOM THE GATE IS OPEN.
CUSTOM THE PUMP HAS STOPPED PLEASE CALL 07000000000.

Use only text or number characters in the message. The message will end where there is a full stop. Do not use a full stop in the middle of the message.

4.4 Changing the Maximum Ring Time

The maximum time for which the system will attempt dialling before dialling the next number is set using the RTIME command. The default time limit is 60s. The RTIME command is specified in seconds and can be set from 1s to 255s. Most calls will require at least 15s for connection which is included in RTIME.

RTIME 45**.** sets the maximum ring time to 45 seconds

4.5 Changing the Maximum Call Time

The maximum time limit for an answered call is set using the CTIME command. The default time limit is 45s. The CTIME command is specified in seconds and can be set from 1s to 255s.

CTIME 45. sets the maximum call time to 45 seconds

When sent with additional time information the relay is activated for however many seconds or minutes specified.

e.g.	**OPEN**	activates relay indefinitely
	on	activates relay indefinitely
	open 10.	10 second activation time (**s** parameter optional)
	Open 250s	250 second activation time
	ON 1m.	1 minute activation time
	open 960m.	16 hour (16 x 60mins) activation time
	CLOSE	deactivates relay under all conditions
	OFF	deactivates relay under all conditions

If the system loses power the relay state is restored when the power is reconnected!

3.8 Exit Switch Enable

The input connection can be used to activate the output relay which is ideal for connection to a secure-side exit switch. It uses the trigger level for the input text message (see INLVL) and activates the relay as per a phone call. To enable the exit switch input the EXIT command is sent to the board as follows:

EXIT ENABLE	enables the exit switch input
Exit disable	disable the exit switch input

4.1 Auto-dialler: Input Triggered SMS Text Message Sending and Autodialing

The input can be used to trigger the sending of a customisable SMS text message to all of the 'text numbers' (see section **1.3 Number Types**) and to sequentially dial all of the 'call numbers' (see section **1.3 Number Types**).
Call numbers are given priority and are dialled before the sending of SMS text messages to the Text Numbers. If no call numbers are stored no call dialling will occur and the system will begin sending SMS text messages straight away.
Calls are dialled in the order in which they are added. The numbers are dialled sequentially until a call is answered and rejected (hung-up) or a call is answered and the # key is pressed or until all of the numbers have been dialled.
If a call is answered the system will automatically hang up the call after 5s. The board will then call the next number. During the 5s call the recipient can end dialling by holding the # key on their phone or by ending the call if the recipient is a mobile phone After dialling is complete, the system will proceed to send the customisable text message to the list of text numbers.
The maximum call length in auto-dialler mode is fixed at 5s. The maximum ring time (the time between dialling and call pick up) can be set using the RTIME command.

The system is able to send a SMS text message to up to 511 'text numbers' (see section **1.3 Number Types**). If no text numbers are stored no messages will be sent.

To enable this service (the auto-dialler) the following command is sent via a SMS text message by any master telephone number:

INPUT Enable	enables the change state text message
INPUT Disable	disables the input triggered text message

To receive the list of numbers the LIST command is used. The master phone must send the following SMS text message to the system:

List

No further characters are required and are ignored if received.

The response format shows the last 8 digits of the stored number followed by a space and the next number and so on…(the master will not appear in the list but will also be valid).

The numbers are in the reverse order to the order they were added with the primary master not displayed.

e.g. 33333333 22222222 11111111 00000000

2.8 Finding a Number in the Memory

When a large number of numbers are stored in the memory using the LIST command can be impractical. To find whether an individual number is stored in the memory the master user sends the following command to the board:

QUERY<space>*number*. or
QNUM<space>*number*

NB the number should be the full number (not the 8-digit truncated number)

If the number is present the LED will flash 4 times and if not in the memory the LED will light twice for 2 seconds. If TEXTRES is enabled an SMS text message will be sent with the result.

2.9 Clearing All Numbers and Settings

The CLEARALL command is used to erase all stored user and master numbers. To erase all numbers the following SMS text message is sent by a master number:

CLEARALL

No response is sent by the system to acknowledge the command

2.10 Result Acknowledgement Message

The system can be setup to send a SMS text message to acknowledge a command. This acknowledges the result of the last command processed such as adding a new user number. The SIM card in the system must have sufficient credit for sending SMS text messages. To enable/disable the service the following text message is sent by the master number:

TEXTRES enable (or also valid: **TEXTRES e**)

TEXTRES DISABLE (or also valid: **TEXTRES d)**

The result message 'Operation Successful' is sent when the service is enabled

3 Relay Operation/Access Control

3.1 Enabling Any Number and Disabling Open-on-Call

The system can be setup to allow any number to operate the relay output. To enable any call the CALL command is used with the action ANY and is sent by the master phone in the following format:

Call any

To return the system to operate from only valid user numbers the LIST action is sent with the CALL command as follows:

call list

To disable activation of the relay by calling the following command is sent to the board (the relay can still be activated by SMS text; see OPEN/ON & CLOSE/OFF commands):

CALL NONE

If TEXTRES is enabled the system will respond with the 'Operation Successful' message.

3.2 Call Reject

By default any call to the system will be allowed to ring indefinitely (or up to the host network time limit). This is to avoid calls being diverted to voicemail when rejected by the system. However the system can be instructed to reject (hang up) calls using the REJECT command:

REJECT ALL rejects all *valid* calls

The reject command can also be used to determine the status of the relay when in toggle mode by sending the following command:

REJECT OPEN rejects the call when the call is deactivating the relay
connects the call when the call is activating the relay

REJECT NONE disables all call rejection

3.3 Connecting a Call

By default, when called the system is set to ring indefinitely or until the SIM card network operator transfers the call to voicemail. However the system can be set to connect a call when the input is **OP**en (high/12V) or **Closed** (low/0V). This is done to allow the caller to know the state of the input even when the system has insufficient credit to send a status SMS text message. See also the REJECT command if call rejection is preferred.

To change the connect mode the CONN command is sent by the master phone with the action **CL** or **OP**. To disable connect on call the **NO**ne action is sent.

e.g. **CONN CL** connect when input high
CONN OP connect when input low
CONN NO do not connect call

3.4 Input/Output Status Message

To determine the current status of the input terminal and output relay the STATUS command is sent to the system telephone number by a master phone as follows:

STATUS

The system will respond with a SMS text message as follows:

RELAY OPEN INPUT LOW relay not activated/input closed (GND)
RELAY CLOSED INPUT HIGH relay activated/input open (+V)

3.5 Relay Activation Mode

When a valid call is received the relay can be set to activate for a set period of time (set by the RLYTIME command), to activate whilst the caller is ringing or to toggle between states on each call. By default the relay mode is set for timed (pulsed) activation. To switch to toggle mode the following message is sent to the system by the master number:

RLYMODE TOGGLE enables toggle mode

To activate the relay for however long the caller rings (n.b. turn off voicemail!)
RLYMODE RING relay active whilst phone rings

To revert to timed (pulsed) mode the following message is sent:
RLYMODE PULSE relay Normally Open (NO)

3.6 Relay Activation Time

The RLYTIME command is used to adjust the time the relay is active following a call when RLYMODE is set to NO. By default the relay time is set to 3s. The time can be set from 1s to 999 seconds or 1 to 999 minutes using this command.

To change the activation time the master number sends a SMS text message as follows:

RLYTIME *seconds.*

e.g. **rlytime 10.** 1 second activation time
rlytime 250s 250 second activation time
Rlytime 1m. 1 minute activation time
RLYTIME 960m. 16 hour (16 x 60mins) activation time

3.7 OPEN/ON & CLOSE/OFF Commands

The OPEN and ON commands are used to activate the relay with a SMS text message. The CLOSE and OFF commands deactivate the relay, whether activated by the OPEN or ON command or a call. When the OPEN command is sent without any additional instructions the relay is activated indefinitely. When sent with a value and **m**(inutes) or **s**(econds) parameter the relay activates for a set period of time. The maximum number length is three characters therefore the timer is limited to 999 seconds or 999 minutes. If the m or s parameter is not sent then the timer value is read as the number of seconds.
The ON and OFF commands are identical to the OPEN and CLOSE commands respectively and can be used interchangeably.